Amendments to the Claims

Please amend Claims 26 and 53. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1-25. (Cancelled)

26. (Currently Amended) A proton-conducting polymer membrane which comprises polyazoles containing sulfonic acid groups and is obtainable by a process comprising the steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic [[~~aids~~]] compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two carboxylic groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a carboxylic group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

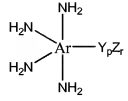
C) applying a layer using the mixture from step B) to a support, thus forming a membrane on the support; or

D) applying the solution or dispersion from step A) to a support, thus forming a membrane on the support; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the membrane from step C) or step E) until the membrane is self-supporting.

27. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises aromatic or heteroaromatic tetraamino compounds of the formula (A):



(A)

wherein

Ar is an aromatic or heteroaromatic group;

Y is a bond or a group having from 1 to 20 carbon atoms;

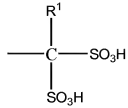
p is an integer from 1 to 4 and represents the number of bonds or groups Y via which the group Z is bound to the group Ar;

r is an integer from 1 to 4 and represents the number of groups Z which are bound to the group Y or, if Y is a bond, to the aromatic or heteroaromatic group Ar; and

Z is a group of the general formula (1):

$-SO_3H$ (1);

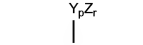
or the general formula (2):



(2);

wherein R^1 is a hydrogen atom or a group having from 1 to 20 carbon atoms.

28. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises aromatic or heteroaromatic carboxylic compounds of the formula (B):



(B);

wherein

Ar is an aromatic or heteroaromatic group;

X is a halogen atom or a group of the formula OR^2, where R^2 is a hydrogen atom or a group having from 1 to 20 carbon atoms;

Y is a bond or a group having from 1 to 20 carbon atoms;

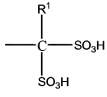
p is an integer from 1 to 4 and represents the number of bonds or groups Y via which the group Z is bound to the group Ar;

r is an integer from 1 to 4 and represents the number of groups Z which are bound to the group Y or, if Y is a bond, to the aromatic or heteroaromatic group Ar; and

Z is a group of the general formula (1):

(1);

or the general formula (2):



(2);

wherein R^1 is a hydrogen atom or a group having from 1 to 20 carbon atoms.

29. (Previously Amended) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises aromatic or heteroaromatic tetraamino compounds which contain no sulfonic acid groups and aromatic or heteroaromatic carboxylic compounds which contain at least one sulfonic acid group.

30. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises 3,3′,4,4′-tetraaminobiphenyl, 2,3,5,6-tetraaminopyridine, or 1,2,4,5-tetraaminobenzene.

31. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises: isophthalic acid; terephthalic acid;; phthalic acid; 5-hydroxyisophthalic acid; 4-hydroxyisophthalic acid; 2-hydroxyterephthalic acid; 5-aminoisophthalic acid; 5-N,N-dimethylaminoisophthalic acid; 5-N,N-diethylaminoisophthalic acid; 2,5-dihydroxyterephthalic acid; 2,5-dihydroxyisophthalic acid; 2,3-dihydroxyisophthalic acid; 2,3-dihydroxyphthalic acid; 2,4-dihydroxyphthalic acid; 3,4-dihydroxyphthalic acid; 3-fluorophthalic acid; 5-fluoroisophthalic acid; 2-fluoroterephthalic acid; tetrafluorophthalic acid; tetrafluoroisophthalic acid; tetrafluoroterephthalic acid; 1,4-naphthalenedicarboxylic acid 1,5-naphthalenedicarboxylic acid 2,6-naphthalenedicarboxylic acid 2,7-naphthalenedicarboxylic acid diphenic acid 1,8-dihydroxynaphthalene-3,6-dicarboxylic acid bis(4-carboxyphenyl) ether benzophenone-4,4′-dicarboxylic acid bis(4-dicarboxyphenyl) sulfone; biphenyl-4,4′-dicarboxylic acid; 4-trifluoromethylphthalic acid; 2,2-bis(4-carboxyphenyl)hexafluoropropane; 4,4′-stilbenedicarboxylic acid; 4-carboxycinnamic acid; or their C_1-C_{20}-alkyl esters or C_5-C_{12}-aryl esters, or their acid anhydrides or acid chlorides.

32. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises 2,3-diamino-5-carboxyphenylsulfonic acid, 2,3-diamino-6-carboxyphenylsulfonic acid, and 3,4-diamino-6-carboxyphenylsulfonic acid.

33. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises aromatic tricarboxylic compounds selected from tricarboxylic acids, their C1-C20-alkyl esters or C_5-C_{12}-aryl esters or their

acid anhydrides or their acid halides or tetracarboxylic acids, their C_1-C_{20}-alkyl esters or C_5-C_{12}-aryl esters or their acid anhydrides or their acid halides.

34. (Previously Presented) The membrane of Claim 33, characterized in that the mixture prepared in step A) comprises 1,3,5-benzenetricarboxylic acid (trimesic acid); 2,4,5-benzenetricarboxylic acid (trimellitic acid); (2-carboxyphenyl)iminodiacetic acid, 3,5,3′-biphehyltricarboxylic acid; 3.5,4′-biphenyltricarboxylic acid; 2,4,6-pyridinetricarboxylic acid; benzene-1,2,4,5-tetracarboxylic acid; naphthalene-1,4,5,8-tetracarboxylic acid; 3,5,3′,5′-biphenyltetracarboxylic acid; benzophenonetetracarboxylic acid; 3,3′,4,4′-biphenyltetracarboxylic acid; 2,2′,3,3′-biphenyltetracarboxylic acid; or 1,2,5,6-naphthalenetetracarboxyllic acid.

35. (Previously Presented) The membrane of Claim 33, characterized in that the content of tricarboxylic acid or tetracarboxylic compounds is in the range of from 0 to 30 mol% based on dicarboxylic acid used.

36. (Previously Presented) The membrane of Claim 35, characterized in that the content of tricarboxylic acid or tetracarboxylic compounds is in the range of from 0.1 to 20 mol% based on dicarboxylic acid used.

37. (Previously Presented) The membrane of Claim 36, characterized in that the content of tricarboxylic acid or tetracarboxylic compounds is in the range of from 0.5 to 10 mol% based on dicarboxylic acid used.

38. (Previously Presented) The membrane of Claim 26, characterized in that the mixture prepared in step A) comprises heteroaromatic dicarboxylic compounds, tricarboxylic compounds or tetracarboxylic compounds which contain at least one nitrogen, oxygen, sulfur, or phosphorus atom in the aromatics.

39. (Previously Presented) The membrane of Claim 38, characterized in that the mixture prepared in step A) comprises pyridine-2,5-dicarboxylic acid; pyridine-3,5-dicarboxylic acid; pyridine-2,6-dicarboxylic acid; pyridine-2,4-dicarboxylic

acid; 4-phenyl-2,5-pyridinedicarboxylic acid; 3,5-pyrazoledicarboxylic acid; 2,6-pyrimidinedicarboxylic acid; 2,5-pyrazinedicarboxylic acid; 2,4,6-pyridinetricarboxylic acid; benzimidazole-5,6-dicarboxylic acid; or their C_1-C_{20}-alkyl esters or C_5-C_{12}-aryl esters or their acid anhydrides or their acid chlorides are used.

40. (Previously Presented) The membrane as claimed in claim 26, characterized in that the mixture prepared in step A) comprises diaminobenzoic acid or its monohydrochloride and dihydrochloride salts.

41. (Previously Presented) The membrane of Claim 26, characterized in that the heating according to step B) is carried our after the formation of a sheet-like structure according to step C).

42. (Previously Presented) The membrane as claimed in claim 26, characterized in that the solution produced in step A) or step B) further comprises dispersed or suspended polymer.

43. (Previously Presented) The membrane of Claim 26, characterized in that the treatment according to step D) is carried out at temperatures in the range of from 0°C to 150°C in the presence of moisture.

44. (Previously Presented) The membrane of Claim 26, characterized in that the treatment of the membrane in step D) is carried out from 10 seconds to 300 hours.

45. (Previously Presented) The membrane of Claim 26, characterized in that the membrane formed after step D) is crosslinked by action of oxygen.

46. (Previously Presented) The membrane of Claim 26, characterized in that a layer having a thickness of from 20 to 4000 μm is produced in step C).

47. (Previously Presented) The membrane of Claim 26, characterized in that the membrane formed after step D) has a thickness of from 15 to 3000 μm.

48. (Previously Presented) An electrode having a proton-conducting polymer coating which is based on polyazoles and is obtainable by a process comprising the steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 350°C to form the polyazole polymer; and

C) applying a layer using the mixture from step B) to an electrode, thus forming a memrane on the electrode; or

D) applying the solution or dispersion from step A) to an electrode, thus forming a membrane on the electrode; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the membrane from step C) or step E).

49. (Previously Presented) The electrode of Claim 48, wherein the coating has a thickness of from 2 to 3000 μm.

50. (Previously Presented) A membrane-electrode unit comprising at least one electrode and at least one membrane as claimed in Claim 26.

51. (Previously Presented) A membrane-electrode unit comprising at least one electrode having a proton-conducting polymer coating which is based on polyazoles and is prepared by the following steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 350°C to form the polyazole polymer;

C) applying a layer using the mixture from step B) to an electrode, thus forming a membrane on the electrode; or

D) applying the solution or dispersion from step A) to an electrode, thus forming a membrane on the electrode; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the electrode membrane from step C) or step E) until the membrane is self-supporting, and partially hydrolyzing the polyphosphoric acid moieties of at least one membrane as claimed in Claim 26.

52. (Previously Presented) A fuel cell comprising one or more membrane-electrode units as claimed in Claim 51.

53. (Currently Amended) A proton-conducting polymer membrane which comprises polyazoles containing sulfonic acid groups and is obtainable by a process comprising the steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic [[~~aids~~]] compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two carboxylic groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a carboxylic group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

C) applying a layer using the mixture from step B) to a support, thus forming a membrane on the support; or

D) applying the solution or dispersion from step A) to a support, thus forming a membrane on the support; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the membrane from step C) or step E) until the membrane is self-supporting,

wherein the concentration of phosphoric acid in the membrane of step (F) is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer